

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER: 1F-870 cas 156 GF-AG
		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <div style="font-size: 1.5em; font-weight: bold; margin-top: 5px;">09/937033</div>
INTERNATIONAL APPLICATION NO.: PCT/FR00/00634	INTERNATIONAL FILING DATE: 16 MARCH 2000 (16.03.00)	PRIORITY DATE CLAIMED: 23 MARCH 1999 (23.03.99)
TITLE OF INVENTION: RADIATING CABLE		
APPLICANT(S) FOR DO/EO/US: Thierry LINOSSIER		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
1. <input checked="" type="checkbox"/>	This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.	
2. <input type="checkbox"/>	This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.	
3. <input checked="" type="checkbox"/>	This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).	
4. <input checked="" type="checkbox"/>	A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.	
5. <input checked="" type="checkbox"/>	A copy of the International Application as filed (35 U.S.C. 371(c)(2))	
a. <input checked="" type="checkbox"/>	is transmitted herewith (required only if not transmitted by the International Bureau --in French language).	
b. <input type="checkbox"/>	has been transmitted by the International Bureau. (see attached copy of PCT/IB/308)	
c. <input type="checkbox"/>	is not required, as the application was filed in the United States Receiving Office (RO/US).	
6. <input checked="" type="checkbox"/>	A translation of the International Application into English (35 U.S.C. 371(c)(2)).	
7. <input type="checkbox"/>	Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).	
a. <input type="checkbox"/>	are transmitted herewith (required only if not transmitted by the International Bureau).	
b. <input type="checkbox"/>	have been transmitted by the International Bureau.	
c. <input type="checkbox"/>	have not been made; however, the time limit for making such amendments has NOT expired.	
d. <input type="checkbox"/>	have not been made and will not be made.	
8. <input type="checkbox"/>	A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).	
9. <input checked="" type="checkbox"/>	An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).	
10. <input type="checkbox"/>	A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).	
Item 11. to 16. below concern document(s) or information included:		
11. <input checked="" type="checkbox"/>	An Information Disclosure Statement under 37 CFR 1.97 and 1.98.	
12. <input checked="" type="checkbox"/>	An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.	
13. <input checked="" type="checkbox"/>	A FIRST preliminary amendment.	
14. <input type="checkbox"/>	A SECOND or SUBSEQUENT preliminary amendment.	
15. <input type="checkbox"/>	A substitute specification.	
16. <input checked="" type="checkbox"/>	A change of power of attorney and/or address letter.	
16. <input checked="" type="checkbox"/>	Other items or information: INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT/IPEA/409--in French language), INTERNATIONAL SEARCH REPORT, APPLICATION DATA SHEET, ABSTRACT	

ATTORNEY'S DOCKET NO.
1F-870 cas 156 GF-AG

page 2 of 2

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Thierry LINOSSIER

Box Non-fee Amendment

Serial No. (unknown)

GROUP

Filed herewith

Examiner

RADIATING CABLE

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to the first Official Action and calculation of the filing fee, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please make the following insertions:

Page 1, between lines 5 and 6, please insert the following heading:

--BACKGROUND OF THE INVENTION--

and between lines 23 and 24, please insert the following heading:

--OBJECTS AND SUMMARY OF THE INVENTION--

Page 2, between lines 12 and 13, please insert the following heading:

--BRIEF DESCRIPTION OF THE DRAWINGS--,

and between lines 23 and 24, please insert the following heading:

--DETAILED DESCRIPTION OF THE INVENTION--.

09/93/033

Thierry LINOSSIER

IN THE CLAIMS:

Please amend claims 1-12 as follows:

--1/(Amended) A radiating cable comprising a pair of insulated conductor wires (2), the cable comprising at least one cable segment (1) having first ends (3) connected to a load (4) equal to an impedance characteristic of the cable segment, and second ends (5) connected to a connector.

2/(Amended) A radiating cable according to claim 1, comprising at least two cable segments whose second ends (5) are connected to the connector (6) in a parallel configuration.

3/(Amended) A radiating cable according to claim 2, wherein the two cable segments (1) are identical.

4/(Amended) A radiating cable according to claim 1, wherein the pairs of insulated conductor wires (2) are placed in a supporting sheath (9).

5/(Amended) A radiating cable according to claim 1, wherein the insulated conductor wires are twisted together, at least in part.

Thierry LINOSSIER

6/(Amended) A radiating cable according to claim 5, wherein the insulated conductor wires (2) are twisted at a pitch lying in the range about 15 times to about 30 times the diameter of the insulated wires.

7/(Amended) A radiating cable according to claim 4, wherein the wires are twisted alternately with right-handed twist and with left-handed twist.

8/(Amended) A radiating cable according to claim 7, wherein a portion of cable with right-handed twist is separated from a portion of cable with left-handed twist by a portion of cable in which the insulated wires are substantially parallel to each other.

9/(Amended) A radiating cable according to claim 1, including a dielectric tape (7) in contact with the insulated conductor wires.

10/(Amended) A radiating cable according to claim 1, including metal tapes wound helically without overlap around the pairs of insulated conductor wires.

093703 093704

Table 1. Demographic characteristics of the study population	
Age (years)	65.0 ± 1.5
Gender	
Male	50.0
Female	50.0
Education (years)	12.0 ± 1.0
Marital status	
Married	60.0
Single	40.0
Occupation	
Retired	70.0
Unemployed	30.0
Income (USD/month)	1,200.0 ± 200.0
Health status	
Good	60.0
Poor	40.0
Smoking status	
Smoker	30.0
Non-smoker	70.0
Alcohol consumption	
Drinker	20.0
Non-drinker	80.0
Comorbidities	
Hypertension	40.0
Diabetes	30.0
Cholesterol	20.0
Arthritis	10.0
Depression	10.0
Medication use	
Yes	60.0
No	40.0

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Non-drinker	80.0
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Hypertension	40.0
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Cholesterol	20.0
Arthritis	10.0
Depression	10.0
Other	10.0

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Comorbidities	
Hypertension	40.0
Diabetes	30.0
Cholesterol	20.0
Arthritis	10.0
Depression	15.0
Medication use	
Yes	50.0
No	50.0

Variable	Mean	SD	Min	Max
Age	34.5	10.2	21	55
Gender	0.5	0.5	0	1
Marital status	0.6	0.5	0	1
Education	12.5	1.5	9	16
Income	15.2	8.5	5	35
Health status	1.2	0.8	0	3
Stress level	2.5	1.2	1	4
Life satisfaction	3.8	1.5	1	5
Work engagement	4.2	1.0	2	5
Organizational commitment	4.5	1.2	2	5
Turnover intention	1.5	1.0	0	3
Job satisfaction	3.5	1.2	1	5
Perceived organizational support	4.0	1.0	2	5
Psychological contract	3.2	1.2	1	5
Trust in supervisor	3.8	1.0	2	5
Organizational justice	3.5	1.2	1	5
Employee voice	3.0	1.0	1	5
Employee silence	2.5	1.0	1	5
Employee withdrawal	1.5	1.0	0	3
Employee turnover	0.5	0.5	0	1

Variable	Mean	SD	Min	Max
Age	34.5	10.2	21	55
Gender	0.5	0.5	0	1
Marital status	0.6	0.5	0	1
Education	12.5	1.5	9	16
Income	15.2	8.5	5	35
Health status	1.2	0.8	0	3
Stress level	2.5	1.2	1	4
Life satisfaction	3.8	1.5	1	5
Work engagement	4.2	1.0	2	5
Organizational commitment	4.5	1.2	2	5
Turnover intention	1.5	1.0	0	3
Job satisfaction	3.5	1.2	1	5
Perceived organizational support	4.0	1.0	2	5
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Employee withdrawal	1.5	1.0	0	3
Employee turnover	0.5	0.5	0	1

1/ A radiating cable comprising a pair of insulated conductor wires (2), the cable ~~being characterized in that it comprises~~ comprising at least one cable segment (1) having first ends (3) connected to a load (4) equal to an impedance characteristic of the cable segment, and second ends (5) connected to a connector.

3/ A radiating cable according to claim 2, characterized
15 ~~in that wherein~~ the two cable segments (1) are identical.

5/ A radiating cable according to ~~any one of~~ claims 1 to 4, characterized in that wherein the insulated conductor wires are twisted together, at least in part.

30 7/ A radiating cable according to claim 4 ~~or claim 6,~~
~~characterized in that~~ wherein the wires are twisted
alternately with right-handed twist and with left-handed
twist.

35 8/ A radiating cable according to claim 7, characterized
in that wherein a portion of cable with right-handed

twist is separated from a portion of cable with left-handed twist by a portion of cable in which the insulated wires are substantially parallel to each other.

- 5 9/ A radiating cable according to ~~any one of~~ claims 1 to 8, ~~characterized in that it includes~~ including a dielectric tape (7) in contact with the insulated conductor wires.
- 10 10/ A radiating cable according to ~~any one of~~ claims 1 to 9, ~~characterized in that it includes~~ including metal tapes wound helically without overlap around the pairs of insulated conductor wires.
- 15 11/ A radiating cable according to claim ~~10 as dependent on claim~~ 9, including metal tapes wound helically without overlap around the pairs of insulated conductor wires, and ~~characterized in that~~ wherein the metal tapes (10) extend between the dielectric tape (7) and the outer
- 20 supporting sheath (9).
- 12/ A radiating cable according to ~~any one of~~ claims 1 to ~~11, characterized in that~~ wherein the two wires of the pair differ from each other in at least one parameter
- 25 comprising: conductor diameter, conductor nature or structure, and the thickness or the nature of the insulation surrounding the conductors.

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A RADIATING CABLE

The present invention relates to a radiating cable for use in particular in the field of cellular telephony or in local area networks for transmitting data by wireless at up to about 2.4 gigahertz (GHz).

The provision of radio coverage in large buildings often requires dedicated equipment to be installed. This coverage is obtained by means of antennas placed inside such buildings.

Technically, it would be advantageous to use radiating cables based in passages, however that gives rise to costs that are often unacceptable. Present-day radiating cables are coaxial cables with slots in periodic patterns and they are expensive, bulky, rigid, and difficult to lay.

Furthermore, when cabling buildings, the high levels of performance provided by present-day radiating cables are unnecessary. The object of the invention is to propose a radiating cable of low cost that is easy to lay, while presenting performance that is sufficient to ensure satisfactory transmission of signals within a building or a vehicle.

The present invention provides a radiating cable comprising a pair of insulated conductor wires, at least one cable segment having first ends connected to a load equal to an impedance characteristic of the cable segment, and second ends connected to a connector. This provides a cable of very great flexibility and compactness which can easily be fixed in the passages of a building by means of the usual techniques for fixing an ordinary telephone cable and which also presents impedance that is independent of length.

In an advantageous version of the invention, the cable has at least two cable segments whose second ends are connected in parallel to the connector. Given the equivalent impedance obtained by connecting the cable segments in parallel, this makes it possible to provide a

cable that presents impedance matched to the transceiver to which the radiating cable is connected while making the radiating cable out of cable segments each presenting an impedance that is higher, i.e. generally having better transmission performance than a single cable matching the nominal impedance of the transceiver.

In yet another advantageous aspect of the invention, the two cable segments are identical. This minimizes constraints on storage, and the cable can be installed without any need to identify the cable segments.

Other characteristics and advantages of the invention will appear on reading the following description of a particular non-limiting embodiment of the radiating cable of the invention, given with reference to the accompanying figures, in which:

- Figure 1 is a diagram of a radiating cable of the invention comprising two cable segments connected in parallel; and

- Figure 2 is a perspective view of a portion of a cable of the invention.

With reference to the figures, the radiating cable constituting the particular embodiment shown comprises two cable segments given overall references 1, each segment comprising a twisted pair of insulated conductor wires 2 having first ends 3 connected to a load 4 and second ends 5 connected in a parallel configuration to a connector 6.

In this preferred embodiment, both cable segments 1 are identical and each is made from a pair of solid copper conductors having a diameter of 1.38 millimeters (mm) and covered in insulation having a thickness of 2.2 mm of cellular polystyrene expanded by 41% and covered in a polyethylene skin having a thickness of 0.08 mm. The capacitance of the wire made in this way is 210 picofarads per meter (pF/m) and the insulation has a dielectric constant of 1.463. A cable segment comprising a twisted pair of insulated conductors as described above

then has a characteristic impedance of 100 ohms (Ω) so that when the wires are connected to 100 Ω load, the impedance of the cable segments is maintained at 100 Ω , regardless of its length. Two cable segments connected in parallel then have an equivalent impedance of 50 Ω corresponding to the nominal impedance normally required at the input/output (I/O) of a transceiver. The resulting cable is well-balanced, both for transmission and for reception, and when account is taken of its linear attenuation, each cable segment can be up to about 100 meters (m) long for transmission at 450 megahertz (MHz), about 75 m long for 900 MHz, about 45 m long for 1800 MHz, and about 35 m long for 2.4 GHz.

As shown in Figure 2, the insulated conductors are held together by a dielectric tape 7 made of polyester, polypropylene, or more simply of paper, but preferably made of a material that enables the cable to withstand fire, such as a mineral tape of mica or of glass silk. In this embodiment, the dielectric tape 7 is covered in a series of helically-wound metal tapes 8, having edges that are spaced apart by gaps that are preferably about one or two times the width of the metal tapes so that at high frequency the metal tape contributes to maintaining the characteristic impedance of the radiating cable at a value that is constant, while allowing radiated energy to escape through the gaps between the metal tapes 8. It is also possible to replace the metal tapes 8 by a plurality of metal wires wound around each of the insulated conductor wires.

The cable segment preferably also includes a thin outer sheet 9 of thermoplastic material or of elastomer.

Naturally, the invention is not limited to the particular embodiment described and can be modified without going beyond the ambit of the invention as defined by the claims.

In particular, although the cable of the invention is described in an embodiment comprising identical cable

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The flexibility of the cable can be improved by replacing solid conductors with wires made up of multiple twisted strands.

It is also possible to make the cable of the invention without using metal tapes and/or a dielectric tape.

CLAIMS

- 1/ A radiating cable comprising a pair of insulated conductor wires (2), the cable being characterized in that it comprises at least one cable segment (1) having first ends (3) connected to a load (4) equal to an impedance characteristic of the cable segment, and second ends (5) connected to a connector.
- 2/ A radiating cable according to claim 1, characterized in that it comprises at least two cable segments whose second ends (5) are connected to the connector (6) in a parallel configuration.
- 3/ A radiating cable according to claim 2, characterized in that the two cable segments (1) are identical.
- 4/ A radiating cable according to any one of claims 1 to 3, characterized in that the pairs of insulated conductor wires (2) are placed in a supporting sheath (9).
- 5/ A radiating cable according to any one of claims 1 to 4, characterized in that the insulated conductor wires are twisted together, at least in part.
- 6/ A radiating cable according to claim 5, characterized in that the insulated conductor wires (2) are twisted at a pitch lying in the range about 15 times to about 30 times the diameter of the insulated wires.
- 7/ A radiating cable according to claim 4 or claim 6, characterized in that the wires are twisted alternately with right-handed twist and with left-handed twist.
- 8/ A radiating cable according to claim 7, characterized in that a portion of cable with right-handed twist is separated from a portion of cable with left-handed twist

by a portion of cable in which the insulated wires are substantially parallel to each other.

5 9/ A radiating cable according to any one of claims 1 to 8, characterized in that it includes a dielectric tape (7) in contact with the insulated conductor wires.

10 10/ A radiating cable according to any one of claims 1 to 9, characterized in that it includes metal tapes wound helically without overlap around the pairs of insulated conductor wires.

15 11/ A radiating cable according to claim 10 as dependent on claim 9, characterized in that the metal tapes (10) extend between the dielectric tape (7) and the outer supporting sheath (9).

20 12/ A radiating cable according to any one of claims 1 to 11, characterized in that the two wires of the pair differ from each other in at least one parameter comprising: conductor diameter, conductor nature or structure, and the thickness or the nature of the insulation surrounding the conductors.

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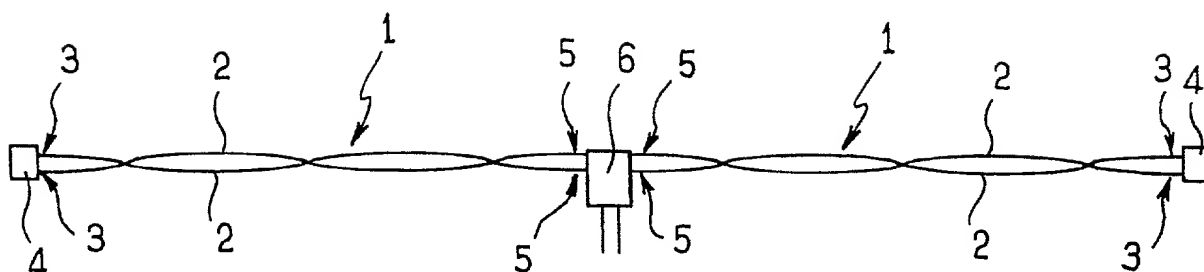


FIG. 1

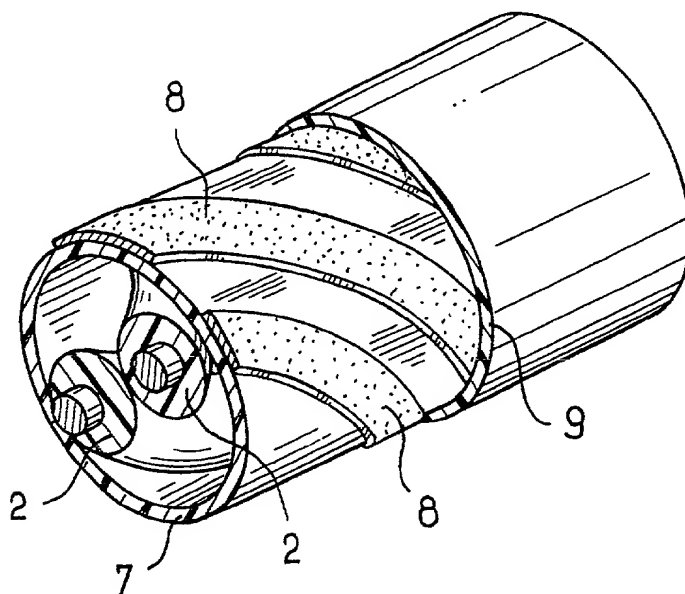


FIG. 2

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: A RADIATING CABLE.

the specification of which: (check one)

REGULAR OR DESIGN APPLICATION

☐ is attached hereto.

☐ was filed on _____ as application Serial No. _____ and was amended on _____ (if applicable).

PCT FILED APPLICATION ENTERING NATIONAL STAGE

March 16, 2000 ☒ was described and claimed in International application No. PCT/FR00/00634 filed on _____ and as amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

PRIORITY CLAIM

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

PRIOR FOREIGN APPLICATION(S)

Country	Application Number	Date of Filing (day, month, year)	Priority Claimed
FRANCE	99 03586	23.03.1999	YES

(Complete this part only if this is a continuing application)

I hereby claim the benefit under 35 USC 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37 Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)

(Filing Date)

(Status—patented, pending, abandoned)

POWER OF ATTORNEY

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

As a named inventor, I hereby appoint the registered patent attorneys represented by Customer No. **000466** to prosecute this application and transact all business in the Patent and Trademark Office connected therewith, including: **Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoît CASTEL, Reg. No. 35,041, Thomas W. PERKINS, Reg. No. 33,027, Roland E. LONG, Jr., Reg. No. 41,949 and Eric JENSEN, Reg. No. 37,855,**

c/o YOUNG & THOMPSON,
~~Second Floor,~~
745 South 23rd Street,
Arlington, Virginia 22202.

Address all telephone calls to Young & Thompson at 703/521-2297. Telefax: 703/685-0573.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Thierry LINOSSIER
(given name, family name)

Inventor's signature  Date September 5, 2001

Residence: 8 rue des Arches 77130 MONTERAU (France) Citizenship: French

Post Office Address: 8 rue des Arches 77130 MONTERAU (France) dit

Full name of second joint inventor, if any:
(given name, family name)

Inventor's signature _____ Date _____

Residence: _____ Citizenship: _____

Post Office Address: _____

Full name of third joint inventor, if any:
(given name, family name)

Inventor's signature _____ Date _____

Residence: _____ Citizenship: _____

Post Office Address: _____

Full name of fourth joint inventor:
(given name, family name)

Inventor's signature _____ Date _____

Residence: _____ Citizenship: _____